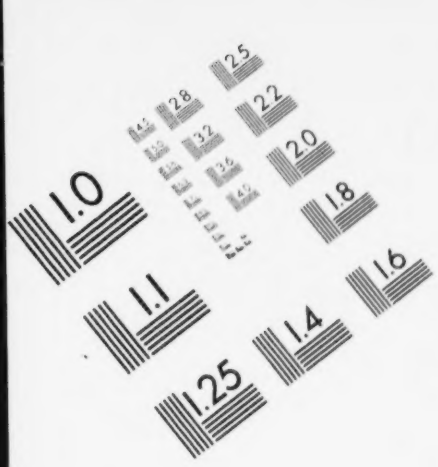

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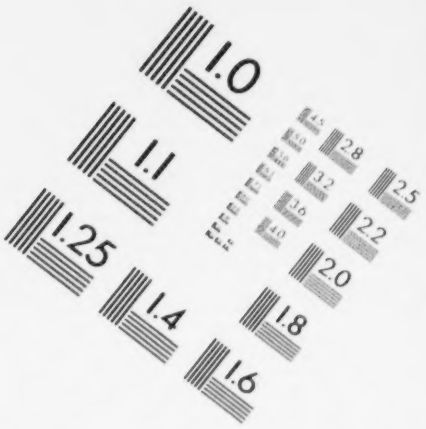

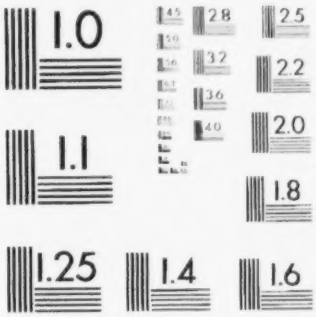

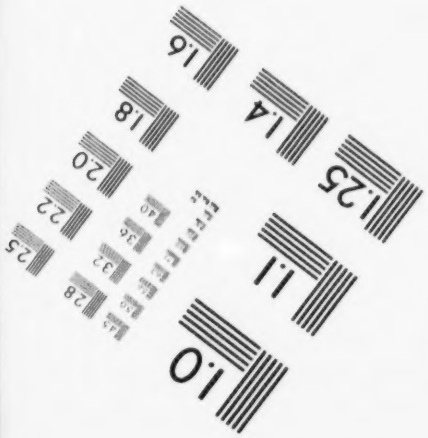

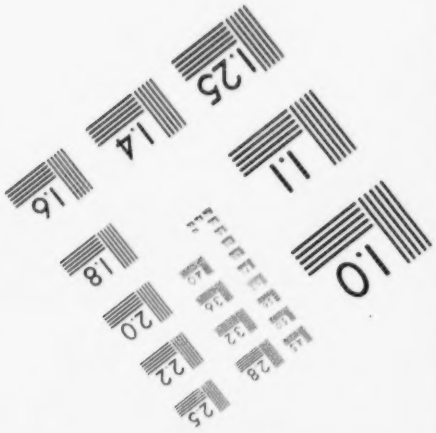

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ABSTRACT

Educators know that quality early childhood intervention programs servicing children at risk for early school failure have immediate or short-term positive effects. However, there are different opinions on the persistence of long-term program effects on participants' academic performances. This study compared the performance on standardized tests at grades one through three of children who participated in South Carolina child development programs for four-year-olds in the 1995-96 school year with that of their nonparticipant peers. The study then compared the students within the program to determine who among them benefited the most. All children (9,977) in the cohort group and a randomly selected comparable group of nonparticipants (7,889) were tracked to the third grade in the 1999-2000 school year. Findings indicated that program participants scored significantly higher on first grade and third grade standardized tests in both English language arts (ELA) and mathematics than did similar nonparticipants. Asian, Caucasian, and female students benefited significantly more from the program than did others. Although participants scored higher than nonparticipants on the second-grade standardized test, the difference was not large enough to be statistically significant. Comparisons between full-day and half-day program participants showed no significant differences on later academic performances. The estimated overall program effect size was 0.2. (Author)

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Later Academic Achievements of Child Development Program Participants: A Longitudinal Study of the South Carolina Early Childhood Development Program for Four -Year-Olds, from 1995-96 to 1999-2000

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Abstract

Educators know that quality early childhood intervention programs serving children at risk for early school failure have immediate or short-term positive effects. However, there are different opinions on the persistence of long-term program effects on participants' academic performances. This study compares the performance on standardized tests at grades one through three of children who participated in South Carolina child development programs for four-year olds in the 1995-96 school year with that of their nonparticipant peers; then it compares the students within the program to determine who among them benefited the most. All children (9,977) in the cohort group and a randomly selected comparable group of nonparticipants (7,889) were tracked to the third grade in the 1999–2000 school year. Program participants scored significantly higher on first grade and third grade standardized tests in both English language arts (ELA) and mathematics than did similar nonparticipants. Asian, Caucasian, and female students benefited significantly more from the program than did others. Although participants scored higher than nonparticipants on the second grade standardized test, the difference was not large enough to be statistically significant. Comparisons between full-day and half-day program participants showed no significant differences on later academic performances. The estimated overall program effect size was 0.2.

Later Academic Achievements of Child Development Program Participants: A Longitudinal Study of the South Carolina Early Childhood Development Program for Four -Year-Olds, From 1995-96 through 1999-2000

Introduction

Quality early childhood intervention programs are seen as one of the most effective ways to prevent learning difficulties and to promote healthy development and well being, especially among children from disadvantaged families (Reynolds, 2002). Many researchers indicate that the negative effects of poverty are reduced when children participate in high-quality early childhood educational programs (Schweinhart et al., 1993; Schweinhart, 2001). Studies and discussions focus on issues such as whether programs had impact on the participants' later achievement and, if so, how long the program impact lasted, who could benefit most from child development programs, and what types of programs worked best for children who needed assistance to achieve success in school.

This longitudinal study attempts to discover if participation in South Carolina's child development programs resulted in long-term effects on children's later academic achievement. All child development participants from the 1995-96 school year and a randomly selected comparable group of nonparticipants were tracked from age four through the first three years of elementary school, with 15,143 students remaining active in the study (85% of the original subjects). Statistical analysis methods including t-tests, analysis of variance (ANOVA), and analysis of covariance (ANCOVA) were utilized at the significance level of .05. Research questions addressed the differences in test performance between those students who participated in a child development program at the age of four and those students who did not. Test scores also are compared by demographic variables among participants in an attempt to determine which groups of children benefited most from participation in a child development program.

The data analysis indicates that participating in the child development program for four-year-olds helps at-risk children perform significantly better academically at grades one and three compared to similar nonparticipants. Asian, Caucasian, and female students benefited more from the program than did others. Limited data from nine school districts revealed that although participants scored higher on reading and mathematics at grade two, the difference was not enough to reach statistical significance. Comparisons between full-day and half-day participants showed no significant differences on later academic performance.

Review of the Literature

There appears to be little dispute about whether programs serving disadvantaged children have immediate or short-term effects (Barnett, 1995). Studies have reported that, in the short-term, children in well-implemented intervention programs consistently show higher levels of cognitive development, early school achievement, and motivation than do children who do not participate in such programs. Barnett for example, in his widely cited study on the effects of preschool programs (1995), synthesized 10 studies that reported IQ gains at some point during or

after program participation. In most instances, the gains were sustained through school entry at age five (Barnett, 1995; Reynolds, 2002).

However, there are different opinions on the persistence of long-term program effects. Barnett (1995) examined 43 published research studies on large-scale public programs serving economically disadvantaged children at age four or younger. These studies measured participants' later achievement on at least one aspect of cognitive development, school progress, or socialization up to the third grade or later. Most of these studies utilized nontreatment comparison groups that were similar to the groups of children who participated in the intervention. No random assignment or quasi-experimental designs were used since such designs are often not practical in educational studies. The sample sizes in these studies ranged from 61 to 3,980 subjects.

Barnett (1995) found that long-term effects measured by achievement test results for reading and mathematics in large-scale programs were quite variable. Four of 21 studies of large-scale programs found no effects at any time. Five studies found initial effects that faded and ceased to be statistically significant by the end of the third grade. The other studies found statistically significant positive program effects in the third grade or later. The variation in findings with respect to the impact on long-term achievement could be the result of the quality of program implementation, design variations, high attrition of subjects, the lack of uniformity in the tests used to measure the achievements, or some other factors.

Other studies found positive results in both short- and long-term gains (Barnett, 1995; Ramey & Ramey, 1998). In his latest study, *Early Childhood Interventions: Knowledge, Practice, and Policy* (2002), Reynolds finds more evidence that program effects are significantly related to early and longer program participation, especially with regard to reading and mathematics achievement. Early participation provides greater learning opportunities for children when their cognitive, language, and motor skills are developing rapidly. Two major studies of long-term programs, the Carolina Abecedarian Project (Campbell et al., 1998) and the Chicago Child-Parent Center (CPC) longitudinal research (Reynolds, 2002), have also noted the advantage of early intervention.

The Carolina Abecedarian study reported a long-lasting benefit for children born to low-income families who were enrolled in an experimental early education program. Of the 111 children studied, 57 were continuously enrolled from infancy through age five in a high-quality early childhood program that used learning games to enhance children's abilities. The other 54 children who constituted the control group did not receive services. Researchers followed these children until age 21. At that age, those students who had received early intervention were more likely to score higher on reading and mathematics tests, to be enrolled in or to have graduated from a four-year college, to have delayed parenthood, and to be gainfully employed (Campbell et al., 1998).

The CPC program is a center-based early intervention effort that provides comprehensive educational and family support services to economically disadvantaged children from preschool to the early elementary grades. The central goal of the program is, in the words of one authority, to "reach the child and parent early, develop language skills and self-confidence, and to

demonstrate that these children, if given a chance, can meet successfully all the demands of today's technological, urban society" (cited in Reynolds, 2002, p. 114).

The longitudinal study of the CPC program included 989 low-income, mostly African-American children who entered the program in preschool and finished kindergarten in 1986 and 550 children from similar disadvantaged neighborhoods who participated in an alternative all-day kindergarten program in the Chicago schools. The groups were well matched according to their eligibility for intervention, family socioeconomic status, gender, and race. At age 20 in 2000, 1,281 children (83 % of the original sample) remained active in the study.

The CPC results presented clear evidence that participants were more ready to learn than were children who did not participate, and relatively high proportions of students in the experimental group scored at or above national norms on standardized tests. These effects carried over to later school achievement. For example, when they had reached the age range between 18 to 20 years old, participating subjects were 29% more likely than those in the comparison group to have completed school. In addition, they had a 33% lower rate of juvenile arrest and a 40% lower rate of special education placement and grade retention (Reynolds, 2002).

Researchers also note that children who have the same experiences in early education may vary in their later academic achievements (Barnett et al., 1987; Barnett, 1995; Reynolds, 2002). Children who were from disadvantaged families or who were from high-poverty neighborhoods benefited more from early interventions. There were some indications that boys benefited more from preschool, but girls benefited more from follow-up intervention (Reynolds, 2002). Another recent national longitudinal study on the effects of early education demonstrated that children who lacked a positive learning environment did not achieve as well as those who did have those resources. These influences persisted from kindergarten through the first grade (Denton & West, 2002).

Some programs appear to be more effective than others. Barnett (1995) discovered that school educational interventions (mostly part day) for four-year-old disadvantaged children, including Head Start and public school programs, have larger estimated effects than child day-care programs. However, he warned that some caution should be exercised in drawing conclusions because programs vary with respect to the children served as well as in the research design adopted by the researchers.

What do we already know about the program effects of the child development programs for four-year-olds in South Carolina? In terms of short-term effects, a report on South Carolina preschool programs published in 1987 demonstrated that program participation helped program participants on performance measures at grade one (Barnett et al., 1987). This study followed a state sample of 362 preschool program participants (the 1983–84 cohort group of the child development programs for four-year olds) and 1,662 nonparticipants to grade one. The researchers found that the students who participated in the preschool program were more likely to score above the readiness cut-off score on the CSAB and were more likely to score higher on the first-grade BSAP (Basic Skills Assessment Program) reading and mathematics tests than were non-preschool program participants, though no statistically significant differences between groups were found.

More recently, three large-scale longitudinal studies conducted by the Office of Research within the South Carolina State Department of Education (SDE) provided additional evidence for the extended effects of early childhood programs. (The results of these studies were published by the SDE in *A Longitudinal Research Report on the Early Childhood Development Program* in 1998, 1999, and 2000.) All three studies constructed comparison groups of children who were matched based on free- or reduced-price lunch program eligibility. Large sample sizes were utilized (8,235, 8,987, and 9,701 subjects respectively remained active in each study). These studies tracked participating children from half-day child development programs at age four to the first grade. The CSAB school readiness scores of participants and nonparticipants were compared. In spite of their higher risk for school failure, program participants performed equally as well as nonparticipants when entering the first grade at public schools. Among program participants it appeared that females and Asian and Caucasian students outperformed their peers. Participants' socioeconomic status and mothers' educational levels were positively related with the students' school readiness at grade one.

In South Carolina, program effect studies have been limited to half-day child development program participants since districts were required to provide at least one half-day program for children at risk. Program effect differences between full-day and half-day child development programs were not known at the time this longitudinal study was conducted. A review of the studies published over the past decade found no research concerning the long-term effect on the achievement of child development program participants beyond the first grade.

Purpose

The purpose of the present study was to test the following hypotheses:

1. Child development program participants performed equally well with nonparticipants from grade one through grade three as measured by standardized tests. There were no academic performance differences between participants and nonparticipants by demographic characteristics as measured by standardized tests.

2. All children in child development programs performed equally well from grade one through grade three as measured by standardized tests.

3. There were no academic performance differences between child development program participants in half-day programs and those in full-day programs in grades one through three as measured by standardized tests.

Method

Design

As students were not randomly assigned to the treatment group, a quasi-experimental design was utilized in which a similar comparison group was established.

Participants

All children (9,977 valid records) who participated in child development programs in 1995–96 were followed longitudinally through the third grade. Most children (95%) participating in child development programs were deliberately identified and recruited through a screening process utilizing the Developmental Indicators in the Assessment of Learning-Revised (DIAL-R), along with supplementary information about the child's family such as education and income level. A comparison group was constructed by randomly selecting children (7,889) who were not participants in child development programs but who were comparable in essential characteristics (eligibility for the free- or reduced-price lunch program) to the children who were participants. Among program participants, roughly half (49%) of the students were males. A similar proportion of males (51%) made up the comparison group. Less than half (45%) of the program participants were non-Caucasian while the random selection provided a sample with more non-Caucasian students (55%) in the comparison group.

Data Collection

Five data sources were utilized in the investigation:

- statewide survey of programs for four-year-olds conducted by the SDE's Office of Research during the 1995–96 school year;
- statewide student testing program files from the 1997–98 school year through the 1999–2000 school year (SDE precode file);
- statewide Cognitive Skills Assessment Battery (CSAB) scores in grade one in the 1997–98 school year;
- Metropolitan Achievement Tests, Seventh Edition (MAT7) scores of available students in nine school districts in spring 1999 (when the cohort group was in the second grade); and
- statewide Palmetto Achievement Challenge Tests (PACT) scores in spring 2000 (when the cohort group was in the third grade).

Data Analyses

First-grade CSAB scores, second-grade MAT7 scores in reading and mathematics, and third-grade PACT English language arts (ELA) and mathematics scores of program participants and nonparticipants were compared. While the CSAB is a commercially available readiness test and the MAT7 is a standardized norm-referenced assessment, the PACT is a criterion-referenced assessment developed by the South Carolina Department of Education. The PACT was first administered in 1999.

In order to determine whether the mean scores of the participants and groups of nonparticipants were significantly different, t-tests were utilized. Analyses of variances (ANOVA) were applied for comparisons of three or more groups when subpopulations were examined. When control of the extraneous variables was desired, analysis of covariance (ANCOVA) was used where possible to achieve statistical control of the extraneous variables in order to reduce error caused by initial differences on participants' later academic performances. The level of statistical significance was set at a probability value of .05 as the threshold; a probability below this threshold ($P < .05$) indicates that a difference of this magnitude could happen by chance less than 5% of the time.

Limitations to the Study

When designing educational program evaluation studies, certain limitations are inherently imposed. For the following reasons, this study should be interpreted with caution and statistical findings should be considered good but not exact.

- A major limitation relates to the fact that due to ethical and practical considerations, individuals were not randomly assigned to treatment groups. With this limitation in mind, it is obvious that "true" experiments cannot be conducted when evaluating programs. This study employs quasi-experimental design; therefore, it is not feasible to rule out alternative explanations for the results.

- Uniform criteria for program implementation, instructional methods, the quality of teachers' professional development activities, and so forth were not mandated at the time when the data for this cohort group were collected.

- The comparison group for this study was randomly selected from nonprogram students eligible for free- or reduced-price school lunch. Students enrolled in the four-year-old child development programs typically have significant readiness deficiency indicators other than low family income. Districts were required to identify and serve students at greatest risk for early school failure. Any selected comparison group likely will consist of students who, overall, have lesser degrees of risk.

- Statewide student achievement test scores were not available for grade two. The analysis in this report used very limited MAT7 data from nine school districts that were not randomly selected, nor were the students guaranteed to be representative of all second-grade students in the state.

- In order to provide reliable statistical significance, the comparison of academic achievements between program and non-program participants by racial group were combined under the categories of Caucasian and non-Caucasian because some minority groups had less than thirty students in the comparison group.

Results

Hypothesis Tested and the Result

Child development program participants performed equally well with nonparticipants from grade one through grade three as measured by standardized tests. There were no academic performance differences between participants and nonparticipants by demographic characteristics as measured by standardized tests.

The hypothesis was rejected by statistical tests. Students who participated in child development programs for four-year-olds scored higher on the first-grade school readiness assessment, second-grade MAT7 tests, and third-grade PACT tests.

First Grade

The comparisons were conducted on first-grade school readiness scores between child development program participants and comparable nonparticipants randomly selected from students who were eligible for the free- or reduced-price school lunch program.

- Students who participated in the child development programs for four-year-olds scored significantly higher in school readiness as measured by the CSAB at grade one.

- In comparisons between the student demographic features of participants and nonparticipants, the findings significantly favored the program participants among Caucasian, non-Caucasian, male, female, and students eligible for the free- or reduced-price lunch program at school. Table 1 describes the details.

Table 1

Comparison between Child Development Program Participants and Nonparticipants: Mean CSAB School Readiness Scores by Demographic Category, Fall 1997

Student Demographic Category	Program Participants N=7,515	Nonparticipants N=7,889	Statistical Significance Level
All	93.9	92.1	< .05
Male	92.9	90.6	< .05
Female	94.7	93.2	< .05
Caucasian	95.6	93.8	< .05
Non-Caucasian	92.5	91.3	< .05
Eligible for free- or reduced-price lunch	92.4	92.1	< .05

Second Grade

The analysis utilized MAT7 test data available from nine school districts. Child development program participants were matched to the second-grade MAT7 data (N=1,224). The same randomly selected nonprogram students eligible for the free- or reduced-price lunch program who served as the first-grade comparison group were matched to their second-grade (N=711) MAT7 test scores in the nine school districts for performance comparisons.

- Child development program participants in the nine school districts scored higher on second-grade MAT7 reading and mathematics than nonparticipants. However, the gaps were not large enough to be statistically significant. Figure 1 shows the differences.

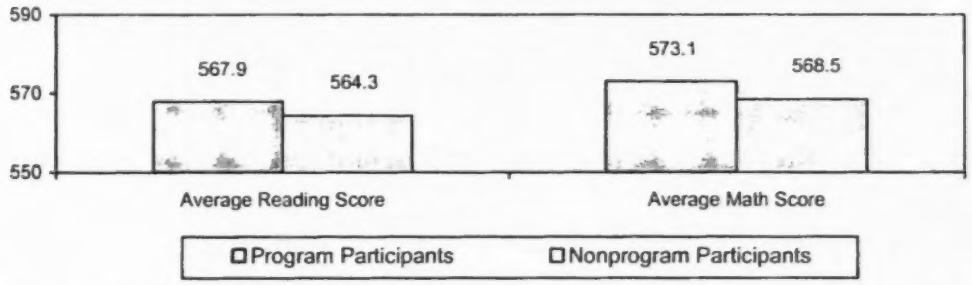

Figure 1. Comparison between Child Development Program Participants and Nonparticipants: Second-Grade MAT7 Performance in Nine School Districts, Spring 1999

- In comparing test scores between participants and nonparticipants, the findings favored the program participants among Caucasian, non-Caucasian, female, and students eligible for free- or reduced-price lunch—though the difference was not large enough to be statistically significant. Only male participants scored significantly higher than the male nonparticipants did on mathematics. Table 2 gives the details.

Table 2

Comparison between Child Development Program Participants and Nonparticipants: MAT7 Reading and Mathematics Performance by Demographic Category, Spring 1999

Student Demographic Category	Mean Scores Reading		Mean Scores Math		Statistical Significance Level	
	Program N=1,213	Nonprogram N=696	Program N=1,216	Nonprogram N=708	Reading	Math
Male	566.7	561.0	571.6	565.2		< .05
Female	570.4	569.5	575.8	574.1		
Caucasian	569.6	564.4	574.7	570.2		
Non-Caucasian	564.0	562.4	569.4	566.0		
Eligible for free- or reduced-price lunch program	564.1	563.1	569.9	567.9		

Third Grade

About fifteen thousand students (15,143), 85% of the original subjects statewide, were matched from prekindergarten at age four through the third grade on the PACT test scores in 2000. The PACT scores of participants and those of randomly selected nonparticipants comparable in eligibility for the free- or reduced-price lunch program were compared.

- Child development program participants scored significantly higher on third-grade PACT in spring 2000 on both subject areas of ELA and mathematics than nonparticipants (P< .05). Figure 2 shows the performance comparisons.

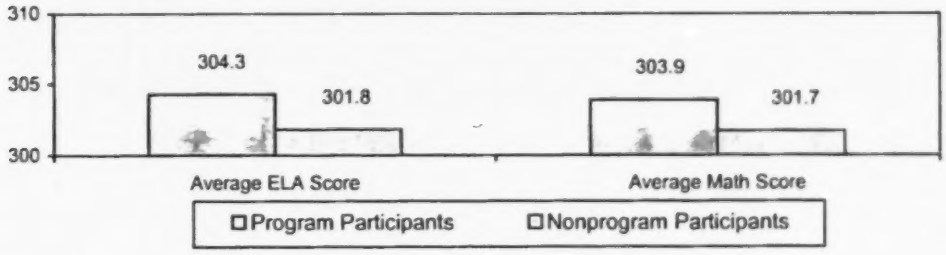

Figure 2. Comparison between Child Development Program Participants and Nonparticipants: Third-Grade Performance on the PACT, Statewide, Spring 2000

- All program participants in subgroups divided by demographic characteristics (male, female, Caucasian, non-Caucasian) scored significantly higher in both subject areas on the PACT than nonparticipants (P< .05) except on mathematics among students from economically disadvantaged families. The higher scores on mathematics favored child development program participants eligible for the free- or reduced-price lunch program, but the difference was not large enough to be statistically significant (see table 3).

Table 3

Comparison between Child Development Program Participants and Nonparticipants: Third-Grade Performance on the PACT by Demographic Category, Spring 2000

Student Demographic Category	Mean Scores ELA		Mean Scores Math		Statistical Significance Level	
	Program N=7,298	Nonprogram N=7,658	Program N=7,342	Nonprogram N=7,725	ELA	Math
Male	302.9	299.8	304.2	301.2	< .05	< .05
Female	305.6	303.9	303.6	302.2	< .05	< .05
Caucasian	309.0	307.9	309.4	308.3	< .05	< .05
Non-Caucasian	299.8	298.2	298.9	297.8	< .05	< .05
Eligible for free- or reduced-price lunch program	300.1	298.9	299.1	298.8	< .05	

Hypothesis Tested and the Result

All children in child development programs performed equally well from grade one to grade three as measured by standardized tests.

This hypothesis was rejected after statistical tests. Asian and Caucasian participants consistently outperformed African-American program participants from grade one to grade three. Participating children not eligible for the free- or reduced-price school lunch program demonstrated higher gains.

Program Impact by Gender, Race, and Lunch Status

The program's impact on groups of participants was measured by comparisons of their scores on the first-grade CSAB, the second-grade MAT7 reading and mathematics, and the third-grade PACT ELA and mathematics. Comparisons were made between subgroups by gender, race, and family income (as measured by eligibility for the free- or reduced-price lunch program). Any demographic groups of participating children with fewer than thirty students were excluded. Tables 4–6 give detailed comparisons by gender, race, and lunch status, respectively.

Table 4

Later Academic Performance of Child Development Program Participants, 1997–98 through 1999–2000 School Years, by Gender

	GRADE 1 School Readiness Mean Scores Statewide	GRADE 2 MAT7 Mean Scores Nine School Districts		GRADE 3 PACT Mean Scores Statewide	
Gender		Reading	Math	ELA	Math
	N=7,515	N=1,194	N=1,197	N=7,294	N=7,337
Female (F)	95.1	570.7	576.1	305.6	303.1
Male (M)	93.2	569.9	574.6	302.9	303.7
Gender group comparison results	F > M			F > M	
Statistical significance level	*P*< .05			*P*< .05	

Table 5

Later Academic Performance of Child Development Program Participants, 1997–98 through 1999–2000 School Years, by Race

	GRADE 1	GRADE 2		GRADE 3	
	School Readiness Mean Scores	MAT7 Mean Scores		PACT Mean Scores	
	Statewide	Nine School Districts		Statewide	
Race	N=7,515	Reading N=1,194	Math N=1,197	ELA N=7,294	Math N=7,337
Asian	97.3				
Caucasian	95.9	573.1	577.9	309.0	309.4
Other	94.2				
African American (AA)	92.8	567.3	572.6	299.8	298.8
Hispanic	91.2			309.0	307.3
Racial group comparison results	Asian>AA & Hispanic Caucasian >AA & Hispanic	Caucasian > AA	Caucasian > AA	Caucasian & Hispanic >AA	Caucasian & Hispanic >AA
Statistical significance level	$P< .05$	$P< .05$	$P< .05$	$P< .05$	$P< .05$

Table 6

Later Academic Performance of Child Development Program Participants, 1997–98 through 1999–2000 School Years, by Lunch Status

	GRADE 1	GRADE 2		GRADE 3	
	School Readiness Mean Scores	MAT7 Mean Scores		PACT Mean Scores	
	Statewide	Nine School Districts		Statewide	
Lunch Status	N=7,515	Reading N=1,194	Math N=1,197	ELA N=7,294	Math N=7,337
Not eligible for free- or reduced-price (NF/R) lunch	96.9	574.4	578.6	310.4	310.4
Eligible for free- or reduced-price lunch (F/R)	92.7	568.5	573.9	300.0	299.5
Lunch group comparison results	NF/R lunch > F/R lunch	NF/R lunch > F/R lunch		NF/R lunch > F/R lunch	NF/R lunch > F/R lunch
Statistical significance level	$P < .05$	$P < .05$		$P < .05$	$P < .05$

Statewide data analyses comparing subgroups among program participants provided evidence that at grades one and three, Asian, Caucasian, and Hispanic children (third grade) and children not eligible for free- or reduced-price lunch scored higher on school readiness measures and on third-grade reading and mathematics. Female participants scored significantly higher on the CSAB and the third-grade PACT ELA. The second-grade data available from the nine school districts revealed that Caucasian participants had better performances than African Americans did on MAT7 reading and mathematics. In addition, the economic status of participants' families (as determined by lunch status) was positively related with second-grade MAT7 reading performances. Children not eligible for the free- or reduced-price lunch program outperformed those who were eligible for the program, except in mathematics at grade two.

More intensive data analyses using *ANCOVA* were conducted in order to reduce the error caused by initial differences among students when they were entering the program and at the first grade. Adjusted mean scores were obtained by removing initial differences at program entry on DIAL-R scores and differences in CSAB scores possibly caused by students' participation in other preschool programs. Similar results were obtained from statewide data analysis except for participants' third-grade mathematics scores on PACT. The adjusted mean scores of male participants were significantly higher than those of their female counterparts, while without statistical control on the extraneous variable, no gender differences were found. The second-grade performance analyses using participants from the nine districts revealed that after the initial differences were removed, participants from disadvantaged families (eligible for free- or reduced-price lunch program) performed equally well on MAT7 reading as students from families not identified as disadvantaged.

Hypothesis Tested and the Result

There were no academic performance differences between child development program participants in half-day programs and those in full-day programs in grades one through three as measured by standardized tests.

The statistical tests showed the hypothesis was not rejected.

First Grade

A limited number of children (N=877) were served by full-day child development programs. A random selection procedure was used to select 991 participants from half-day programs in order to make two similar-sized groups. The first-grade CSAB scores of half-day program participants were compared to the scores of full-day program participants. The findings were that children from these two types of programs scored equally well on first-grade school readiness assessment. No statistical significance was found. Disaggregated student data were also examined between male and female, Caucasian and non-Caucasian, and students eligible for free- or reduced-price lunch and students paying full price for school lunch. No statistical differences were discovered in school readiness scores on the CSAB at grade one.

Second Grade

This comparison was not meaningful since the MAT7 test data were available from only nine school districts and provided an insufficient number of full-day participants (N <30) to yield statistically reliable information.

Third Grade

There was no difference on the third-grade PACT performance between full-day and half-day child development program participants. When disaggregated data were analyzed by male, female, Caucasian, non-Caucasian, eligibility for the free- or reduced-price lunch program, and fully paid lunch students, the differences found were too small for statistical significance.

Discussion

This study focused on the later academic performances of children who participated in the 1995–96 class of the child development program for four-year-olds. It followed the cohort group for four years and compared student performances on the CSAB first-grade school readiness assessment, second-grade MAT7 tests, and third-grade PACT scores between participants and nonparticipants as well as within-program disaggregated populations. The performance differences between full-day and half-day child development program participants on the same tests mentioned above from grade one through grade three were examined. Detailed data analyses yielded the following conclusions:

- Child development programs for four-year-olds had a positive long-term effect on participants' later academic performances in comparison to similar students who did not participate in the program. By definition, the majority of program participants were children whose developmental indicators—including their families' economic and educational backgrounds—placed them at risk academically. In spite of their risk levels, the program participants statewide demonstrated significantly higher scores than nonparticipants on the CSAB first-grade readiness assessment and the third-grade PACT in ELA and mathematics. When disaggregated data analyses were conducted by male, female, Caucasian, non-Caucasian, and free- or reduced-price school lunch students; participants in all subgroups scored significantly higher on the CSAB than nonparticipants. At grade two, only male participants scored significantly higher than their nonparticipant peers did on mathematics. At the third grade, all participants belonging to the above-mentioned demographic groups scored higher in both ELA and mathematics on the PACT than nonparticipants—except for those participants eligible for the free- or reduced-price lunch program, who scored higher than their nonparticipant peers did only on the ELA section of the PACT.

- It appears that child development programs helped Asian, Caucasian, and Hispanic children more than other ethnic groups of children in their later achievement performances on reading and mathematics. Female participants benefited more than male participants from the child development program on measures of reading. Child development program participation appeared less effective for African-American students and participants eligible for free- or reduced-price lunch than for students in other demographic categories.

- Statewide data analysis on the long-term program effect on academic performance of full-day and half-day program participants illustrated that full-day and half-day participants performed equally well on the CSAB and third-grade PACT tests. Second-grade MAT7 student performance data for full-day and half-day participants were insufficient to provide statistically reliable results in a comparison of the two.

- Inferences from statistical tests revealed significant program effect statewide on the participants' later academic performances in grades one and three. Then, what is the practical importance of these findings? Calculations on the estimated effect sizes, *d*, were conducted to detect the practical importance of the program effects. The overall *d* value was 0.2 in terms of program effect on helping the at-risk children on their later academic performances in grades one and three. The positive effect sizes varied by demographic groups within different grades (from 0.1 to 0.2). The positive effect sizes applied to all students across gender and racial groups in the above-mentioned grades. Although an estimated effect size of d=0.2 shows little promise according to Cohen (Kirk, 1995), the program did effectively raise the academic performance of children predicted at risk for early school failure when compared with their non-participant peers. This could be considered a very significant improvement in educational practice, particularly since the effect was cumulative over four years.

Recommendations for Future Research

The following recommendations are based upon the study results:

- Academic performance is but one of the indicators of program effects. Future studies on other program effect indicators such as the reduction of the grade retention rate or the rate of placement of children in special education should be conducted to illustrate, in more depth, the positive effects that child development programs have on other than academic performances.

- Studies should be conducted to identify curricula and teaching methodologies that are more sensitive to the needs of African-American participants and those eligible for the free- or reduced-price lunch program.

- The nature and quality of continued academic assistance provided to participants in their primary grades need to be investigated to determine if additional later academic assistance also reinforces at risk students' later performance after exiting the four-year-old program.

- The program impact on children's later cognitive and social development should be evaluated using both quantitative and qualitative data.

- An examination of the similarities and differences between full-day and half-day programs should be conducted to better understand the relationship between types of programs and participants' later performances.

- A study of the relationship between leadership expertise (that of directors or supervisors of the child development programs) and student outcome should be developed to further address the issue of program quality.

- A study of the relationship between participating children's later academic achievement and the curriculum or pedagogy used in classrooms should be carried out to provide empirical data for identifying effective instructional practices.

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